PATENT ABSTRACTS OF JAPAN

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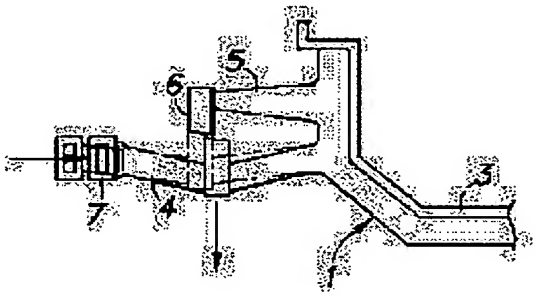
(54) AUTOMOBILE BODY STRUCTURE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an automobile body structure capable of realizing a deformation mode compatible of compacting the body dimensions and reducing crew deceleration to a still more high level.
SOLUTION: A reaction producing member 1 receiving compression load parallel with the deceleration actuating direction at the time of collision is to include a part 4 contracting the longitudinal dimension by bending deformation and a bending deformation checking means 6 for checking the generation of bending deformation and the bending deformation starting point of the part 4 is set by strength setting of the bending deformation checking means 6. Thus a body deceleration pattern of compression deformation higher in the initial stage of collision than after the middle stage of collision can be realized because the lead in the initial stage of collision is received with compression deformation of relatively high stress, the load after the middle stags of collision is received with bending deformation of relatively law stress, and the bend starting load can be regulated by the bending deformation checking means 6.



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CLAIMS

[Claim(s)]
[Claim 1] It is the car body structure of the automobile which it is the car body structure of the automobile equipped with the reaction-force generating member which receives the compressive load which meets in the decelerating operation direction at the time of a collision, and said reaction-force generating member has the part which shrinks the longitudinal direction dimension by flexion deformity, and a flexion-deformity inhibition means prevent generating of said flexion deformity, and is characterized by to set up the flexion-deformity start point of said part by setup of said flexion-deformity inhibition means on the strength.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the car body structure of the automobile which can reduce the deceleration which acts on crew at the time of a collision about the car body structure of an automobile.
[0002]
[Description of the Prior Art] In order to heighten the crew protective effect at the time of a collision in recent years, while setting up appropriately deformation Mohd at the time of the collision of parts other than the habitation space of a car body and reducing the deceleration of the habitation space part of a car body, the car body structure by which it was made for deformation not to reach even habitation space is proposed variously (reference, such as JP,7-101354,A).
[0003] The deceleration of the crew who, on the other hand, has a form connected with the sheet through the seat belt starts for the first time, when the inertial force to the front which acts on crew at the time of a car collision is caught by the seat belt. It is said that it becomes so high that the movement magnitude of crew according [the peak value of this crew deceleration] to inertial force although crew deceleration will reach a peak in the place where crew moved to the front with inertial force at since a spring operation of a seat belt could not be eliminated completely here, and the elongation of a seat belt reached max is large, and generally becomes higher than the average braking deceleration of a car body. Therefore, in order to make small the damage which crew receives at the time of a collision, it is necessary to adjust car-body deceleration so that the time lag of the standup of the crew deceleration over car-body deceleration may become as small as possible.
[0004]
[Problem(s) to be Solved by the Invention] Then, when the artificers of this application performed simulation and the car-body deformation stroke for absorbing a collision impact was made the same, it was checked the direction car-body deceleration was made to become lower henceforth [middle stage] than the early stages of a collision seting constant the deceleration from the early stages of a collision, or making it become high gradually that peak value of crew deceleration can be made low.
[0005] This invention is thought out based on such knowledge, and the purpose is in offering the car body structure of the automobile which can realize deformation Mohd who may be further compatible in high order origin in miniaturization of vehicle dimensions, and reduction of crew deceleration.
[0006]
[Means for Solving the Problem] In order to achieve such a purpose, it sets to this invention. The part which shrinks the longitudinal direction dimension for the reaction force generating member (side member 1 in the gestalt of operation) which receives the compressive load which meets in the decelerating operation direction at the time of a collision by flexion deformity (flection 4 in the gestalt of operation), It has a flexion deformity inhibition means (longitudinal member 6 in the gestalt of operation) to prevent generating of flexion deformity, and the flexion

deformity start point of said part was set up and carried out by setup of a flexion deformity inhibition means on the strength. Since according to this the load on and after the middle stage of a collision can be received by flexion deformity with comparatively low stress and a flexion deformity inhibition means can prescribe a crookedness initiation load while receiving the load in early stages of a collision by the compression set with comparatively high stress, the car-body decelerating pattern with which the early stages of a collision become high from the middle stage of a collision or subsequent ones can be realized.

[0007]

[Embodiment of the Invention] The configuration of this invention is explained to a detail with reference to the example shown in the drawing of attachment in the following.

[0008] Drawing 1 shows the outline of the side member of an automobile in which this invention was applied. This side member 1 is formed combining the extrusion material of an aluminium alloy, and it is installed in the cross direction of a car, applying it under the both-sides empty vehicle room floor 3 of an engine room 2.

[0009] If backward horizontal load is received, the part which extended on both sides of the engine room 2 in a side member 1 is formed as a flection 4 to which the bending configuration of a shallow include angle was given beforehand so that pars intermedia may be crooked downward. Thereby, if a car collides head-on, generating a certain reaction force according to the compressive load at that time, bending deformation is carried out, and a flection 4 will shrink the cross-direction dimension, and will serve to suppress the deceleration of a habitation space part in a certain range.

[0010] The center of the flection 4 of a side member 1 is connected through the longitudinal member 6 which receives the elongation direction load from a flection 4 to the tip of the cantilever 5 with which flexural strength high enough was given. He is trying for flexion deformity initiation stress to become high enough rather than plastic deformation stress by this as for a flection 4.

[0011] Next, about the deformation process of a side member 1 mentioned above, drawing 2 and drawing 3 are referred to collectively and explained to a structure on the street supposing the case where a car collides head-on.

[0012] In the initial stage of a collision, the backward load by the inertia weight of a car body acts to the bumper beam 7 fixed to the front end of a side member 1. By this, in a flection 4, the elastic-region stress of the direction of bending occurs with compressive stress, it takes to this, the elastic-region stress of the direction of hauling occurs in a longitudinal member 6, and car-body deceleration starts steeply (field of a of drawing 3).

[0013] pass the plastic region (field of b of drawing 3) where the tensile stress of a longitudinal member 6 becomes in general fixed -- if breaking load (c points of drawing 3) is reached, a longitudinal member 6 will fracture and the flexion deformity inhibition force by the longitudinal member 6 which was acting on the flection 4 will disappear. Then, since the compressive stress generated in the flection 4 reaches instantly at the yield point and a flection 4 starts bending deformation, the stress of a flection 4 declines quickly and car-body deceleration falls quickly according to this (field of d of drawing 3). If it is made for the elongation of a seat belt to reach a peak in the field to which this car-body deceleration falls, crew deceleration can be reduced sharply. Then, since the bending deformation of a flection 4 advances, generating in general fixed reaction force (plastic region stress) (refer to drawing 2), the fixed deceleration currently crossed to all strokes is maintained the middle stage of a collision (field of e of drawing 3).

[0014] In addition, the peak value of the deceleration in early stages of a collision is decided by breaking load of a longitudinal member 6, and the fixed decelerating value in the middle of a collision is decided by plastic region stress of a flection 4.

[0015] Since the reaction force which deformation of an engine room 2 carried out [reaction force etc.] bottoming, and was generated is added in the end of a collision, car-body deceleration increases, but since crew's inertial force is almost removed inside already and the decelerating difference of a car body and crew is small, the effect on crew deceleration is very small, and can be managed with this field.

[0016] As a flexion deformity inhibition means to set up the flexion deformity initiation load of a

flection 4, although the longitudinal member 6 fractured by the predetermined hauling load shall be used for the above-mentioned example As the actuator 8 which operates according to the output of a decelerating sensor (not shown) shall cancel the mechanical connection to a longitudinal member 46 and a flection 44 as this shows drawing 4 , or shown in drawing 5 A longitudinal member 56 is made to fracture compulsorily using the explosives 9 lit according to the output of a decelerating sensor (not shown), and deformation of a flection 44-54 can take place in snowslide.

[0017] Furthermore, as shown in drawing 6 , the cross-direction member 10 of the pair to which the equal initial bending configuration was both given can be arranged to the vertical symmetry, a flection 64 can be constituted, and it can also consider as the pantograph configuration which connected the center of the cross-direction member 10 of these pairs by the longitudinal member 66.

[0018]

[Effect of the Invention] Thus, according to this invention, the difference of yield stress and plastic deformation stress shall absorb a collision impact by comparatively large buckling distortion. Since decelerating peak value shall be set up by setting up average braking deceleration with bending stress, and setting up the start point of bending deformation by the reinforcement of a deformation inhibition means It is high in early stages of a collision, and the decelerating pattern of the habitation space part of a car body can be set up so that it may become low and in general fixed on and after the middle stage. If the peak value of crew deceleration can be conventionally reduced by small deformation stroke as compared with structure and the same deformation stroke as the former is obtained by this, sharp reduction of crew decelerating peak value can be attained. And since the movement magnitude for a car body in crew's interior of a room can be stopped small, possibility of a secondary collision that crew will run against the indoor structure and will receive a trauma can be reduced.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The outline block diagram of a car body with which this invention was applied
[Drawing 2] The explanatory view showing the deformation process of the side member at the time of a collision
[Drawing 3] The decelerating wave form chart at the time of a collision
[Drawing 4] The partial perspective view of the 2nd example
[Drawing 5] The partial perspective view of the 3rd example
[Drawing 6] The partial perspective view of the 4th example
[Description of Notations]
1 Side Member (Reaction Force Generating Member)
4 Flection (Part)
6 Longitudinal Member (Flexion Deformity Inhibition Means)

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審査請求　未請求　請求項の数１　ＯＬ　（全４頁）

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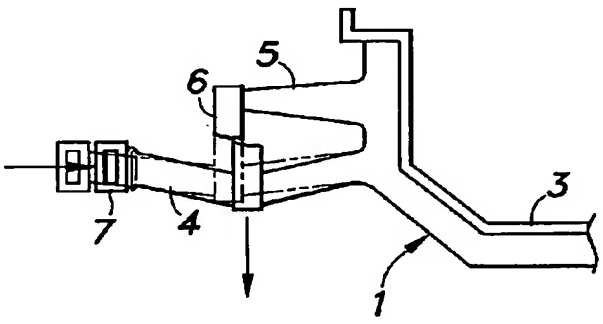
(54)【発明の名称】　自動車の車体構造

(57)【要約】
【課題】　車体寸法のコンパクト化と乗員減速度の低減とをより一層高次元に両立し得る変形モードを実現可能な自動車の車体構造を提供する。
【解決手段】　衝突時に減速度の作用方向に沿う圧縮荷重を受ける反力発生メンバ１を、その長手方向寸法を屈曲変形で収縮させる部分４と、屈曲変形の発生を阻止する屈曲変形阻止手段６とを有するものし、屈曲変形阻止手段の強度設定により、前記部分の屈曲変形開始点を設定する。これによれば、応力が比較的高い圧縮変形で衝突初期の荷重を受けると共に、応力が比較的低い屈曲変形で衝突中盤以降の荷重を受け、かつ屈曲変形阻止手段で屈曲開始荷重を規定することができるので、衝突中盤以降よりも衝突初期が高くなる車体減速度パターンを実現し得る。



【特許請求の範囲】
【請求項１】　衝突時に減速度の作用方向に沿う圧縮荷重を受ける反力発生メンバを備える自動車の車体構造であって、
前記反力発生メンバは、その長手方向寸法を屈曲変形で収縮させる部分と、前記屈曲変形の発生を阻止する屈曲変形阻止手段とを有し、
前記屈曲変形阻止手段の強度設定により、前記部分の屈曲変形開始点を設定することを特徴とする自動車の車体構造。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、自動車の車体構造に関し、特に衝突時に乗員に作用する減速度を低減することのできる自動車の車体構造に関するものである。
【０００２】
【従来の技術】近年、衝突時の乗員保護効果を高めるために、車体の居住空間以外の部分の衝突時の変形モードを適切に設定して車体の居住空間部分の減速度を低減すると共に、居住空間にまで変形が及ばないようにした車体構造が種々提案されている（特開平７－１０１３５４号公報など参照）。
【０００３】一方、シートベルトを介してシートに連結された形になっている乗員の減速度は、車両衝突時に乗員に作用する前方への慣性力がシートベルトに受け止められた時に初めて立ち上がる。ここでシートベルトのばね作用を完全には排除することはできないので、慣性力で乗員が前方へ移動し、シートベルトの伸びが最大に達したところで乗員減速度がピークに達することになるが、この乗員減速度のピーク値は、慣性力による乗員の移動量が大きいほど高くなり、一般に車体の平均減速度よりも高くなると言われている。従って、衝突時に乗員の受けるダメージを小さくするには、車体減速度に対する乗員減速度の立ち上がりの時間遅れがなるべく小さくなるように車体減速度を調整する必要がある。
【０００４】
【発明が解決しようとする課題】そこで本出願の発明者らがシミュレーションを行ったところ、衝突衝撃を吸収するための車体変形ストロークを同一とした場合、車体減速度を、衝突初期よりも中盤以降で低くなるようにした方が、衝突初期からの減速度を一定とするか、あるいは徐々に高くなるようにするよりも、乗員減速度のピーク値を低くできることが確認された。
【０００５】本発明は、このような知見に基づいて案出されたものであり、その目的は、車体寸法のコンパクト化と乗員減速度の低減とをより一層高次元に両立し得る変形モードを実現可能な自動車の車体構造を提供することにある。
【０００６】
【課題を解決するための手段】このような目的を果たすために、本発明においては、衝突時に減速度の作用方向に沿う圧縮荷重を受ける反力発生メンバ（実施の形態中のサイドメンバ１）を、その長手方向寸法を屈曲変形で収縮させる部分（実施の形態中の屈曲部４）と、屈曲変形の発生を阻止する屈曲変形阻止手段（実施の形態中の縦部材６）とを有し、屈曲変形阻止手段の強度設定により、前記部分の屈曲変形開始点を設定するものとしした。これによれば、応力が比較的高い圧縮変形で衝突初期の荷重を受けると共に、応力が比較的低い屈曲変形で衝突中盤以降の荷重を受け、かつ屈曲変形阻止手段で屈曲開始荷重を規定することができるので、衝突中盤以降よりも衝突初期が高くなる車体減速度パターンを実現し得る。
【０００７】
【発明の実施の形態】以下に添付の図面に示した実施例を参照して本発明の構成について詳細に説明する。
【０００８】図１は、本発明が適用された自動車のサイドメンバの概略を示している。このサイドメンバ１は、例えばアルミニウム合金の押出し材を組み合わせて形成されており、エンジンルーム２の両側から車室フロア３の下方へかけて車両の前後方向に延設されている。
【０００９】サイドメンバ１におけるエンジンルーム２の両側に延在した部分は、後向きの水平荷重を受けると中間部が下向きに屈曲するように、浅い角度の曲げ形状が予め与えられた屈曲部４として形成されている。これにより、車両が正面衝突すると、その時の圧縮荷重によってある反力を発生しつつ屈曲部４が曲げ変形してその前後方向寸法を収縮させ、居住空間部分の減速度をある範囲に抑える働きをする。
【００１０】サイドメンバ１の屈曲部４の中央は、屈曲部４よりも十分に高い曲げ強度が与えられた片持ち梁５の先端に対し、伸張方向荷重を受ける縦部材６を介して連結されている。これにより、屈曲部４は、塑性変形応力よりも屈曲変形開始応力が十分に高くなるようにされている。
【００１１】次に上述したサイドメンバ１の変形プロセスについて、路上構築物に車両が正面衝突した場合を想定し、図２および図３を併せて参照して説明する。
【００１２】衝突の初期段階では、サイドメンバ１の前端に固定されたバンパビーム７に対し、車体の慣性重量による後ろ向きの荷重が作用する。これにより、屈曲部４には圧縮応力と共に曲げ方向の弾性域応力が発生し、これに連れて縦部材６には引っ張り方向の弾性域応力が発生し、車体減速度が急峻に立ち上がる（図３のａの領域）。
【００１３】縦部材６の引っ張り応力が、概ね一定となる塑性域（図３のｂの領域）を経て破断荷重（図３のｃ点）に達すると、縦部材６が破断し、屈曲部４に作用していた縦部材６による屈曲変形阻止力が消失する。すると、屈曲部４に発生していた圧縮応力がたちまち降伏点

に達して屈曲部４が曲げ変形を開始するので、屈曲部４の応力が急速に低下し、これに従って車体減速度が急速に低下する（図３のｄの領域）。この車体減速度が低下する領域でシートベルトの伸びがピークに達するようにすれば、乗員減速度を大幅に低減することができる。その後、概ね一定の反力（塑性域応力）を発生しつつ屈曲部４の曲げ変形が進行するので（図２参照）、衝突中盤は全ストロークに渡ってある一定の減速度が維持される（図３のｅの領域）。

【００１４】なお、衝突初期の減速度のピーク値は縦部材６の破断荷重で決まり、衝突中盤の一定減速度値は屈曲部４の塑性域応力で決まる。

【００１５】衝突終盤では、エンジンルーム２の変形が底付きして発生した反力などが上乗せされるので、車体減速度が増大するが、この領域では、既に乗員の慣性力が殆どうち消されていて車体と乗員との減速度差が小さくなっているので、乗員減速度への影響はごく小さくて済む。

【００１６】上記実施例は、屈曲部４の屈曲変形開始荷重を設定する屈曲変形阻止手段として、所定の引っ張り荷重で破断する縦部材６を用いるものとしたが、これは図４に示すように、減速度センサ（図示せず）の出力に応じて作動するアクチュエータ８で縦部材４６と屈曲部４４との機械的な連結を解除するものとしたり、図５に示すように、減速度センサ（図示せず）の出力に応じて着火する爆薬９を用いて縦部材５６を強制的に破断させるものとしたりして、屈曲部４４・５４の変形が雪崩的に起こるようにすることもできる。

【００１７】さらに、図６に示したように、共に等しい初期曲げ形状が与えられた一対の前後方向部材１０を上下対称に配置して屈曲部６４を構成し、これら一対の前後方向部材１０の中央を縦部材６６で連結したパンタグラフ形状とすることもできる。

【００１８】

【発明の効果】このように本発明によれば、降伏点応力と塑性変形応力との差が比較的大きい座屈変形で衝突衝撃の吸収を行うものとし、曲げ応力で平均減速度を設定し、曲げ変形の開始点を変形阻止手段の強度で設定することによって減速度のピーク値を設定するものとしたので、車体の居住空間部分の減速度パターンを、衝突初期に高く、中盤以降に低くかつ概ね一定になるように設定することができる。これにより、従来構造に比して小さな変形ストロークで乗員減速度のピーク値を低減することができ、従来と同一の変形ストロークが得られるならば、乗員減速度ピーク値の大幅な低減を達成し得る。しかも乗員の室内での対車体移動量を小さく抑えることができるので、乗員が室内の構造物に突き当たって傷害を受ける二次衝突の可能性を低減できる。

【図面の簡単な説明】

【図１】本発明が適用された車体の概略構成図

【図２】衝突時のサイドメンバの変形プロセスを示す説明図

【図３】衝突時の減速度波形図

【図４】第２の実施例の部分的な斜視図

【図５】第３の実施例の部分的な斜視図

【図６】第４の実施例の部分的な斜視図

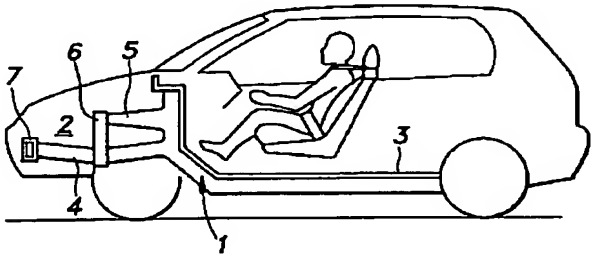
【符号の説明】

１　サイドメンバ（反力発生メンバ）

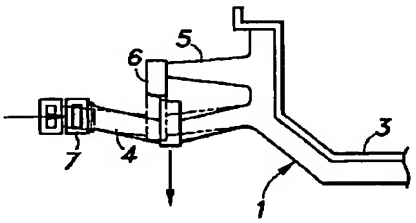
４　屈曲部（部分）

６　縦部材（屈曲変形阻止手段）

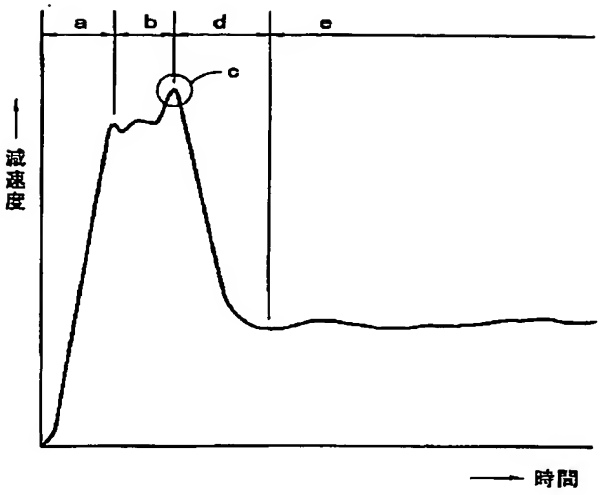
【図１】



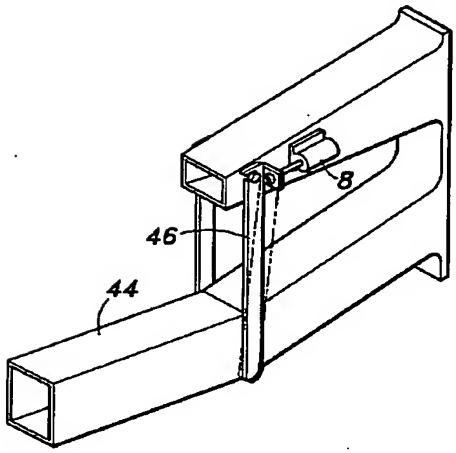
【図２】



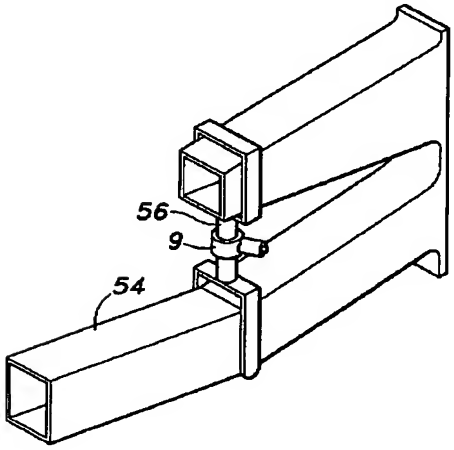
【図３】



【図４】



【図５】



【図６】